

## **DOCTOR APPARATUS**

This United States PCT application is a continuation-in-part of United States Provisional Patent Application Serial No. 60/431,270, filed December 6, 2002, of the same title and by the same inventor on which a claim of priority and benefit of filing  
5 date is made. This invention relates to a type of doctor for a coating apparatus and method for coating a traveling web material, such as paper, or for coating the surface of a roll and then transferring said coating to a traveling web in a pressure nip form by another roll, blade or other pressure applying device.

### **Background of the Invention**

It is known to use a doctor roll in a coater such as a short dwell time applicator ("SDTA") or a film coater as shown in U.S. Patent Nos. 4,250,211 and 5,749,972, these patents being incorporated herein by reference, in conjunction with a backing roll to meter coating applied to a moving paper web or first to a roll surface and then onto  
15 a moving web of paper. These doctor rolls are difficult to locate or hold in a coater as space is restricted. Heretofore, when the doctor roll was loaded into the web or roll surface being coated, the doctor roll was moved toward or away from the web or roll surface to increase or decrease the loading, respectively. Generally, the doctor roll also tended to move downstream in the direction of the web or roll surface travel. This  
20 latter movement was somewhat inconsistent, and consequently variation and/or inconsistency in the coating lay and metering by the doctor roll could occur.

### **Summary of the Invention**

The disadvantages of the prior art are overcome by the method and apparatus of the present invention which provides a method and means for supporting the doctor  
25 roll to minimize any movement or travel of the doctor roll in a direction of that of the moving surface of the web or roll and minimizes the inconsistency of coating applied to the surface of the web or roll. To accomplish this, the roll is supported in a roll carrier or support which is permitted to move or generally pivot on a support rod, generally being used as the motion may be somewhat greater than a true pivot  
30 connection. The support rod itself may form and close off part of the coater application chamber. To support the doctor roll, a rear or downstream (relative to the direction of web or roll surface movement or travel) support for the doctor roll is

provided. To accommodate movement of the roll due to loading by a conventional means (such as a load tube), relative contact surfaces between the roll carrier and roll rear support may be curved or radiused to permit the roll carrier or support and roll therein to move, slide or pivot more freely. Preferably, the rear roll support can be in the form of a releasable element or blade, while the curved or radiused surface may be formed on the rear of the roll carrier or support. Thus, the pivoting of the roll support and moving along the radius provides a more consistent environment for the doctor roll, and therefore lay of coating and/or doctoring of coating on the moving web or roll surface, and consequently more consistently coated paper web.

#### 10 **Description of the Drawing**

Figure 1 is a schematic, full scale as filed, cross sectional elevational view of a doctor assembly of the present invention.

Figure 2 is a full scale as filed, view similar to Figure 1 but of a second embodiment.

15 Figure 3 is a partial view similar to Figure 1 and 2, but showing a roll carrier or support for a solid doctor roll.

#### **Description of the Preferred Embodiment**

Referring to Figure 1, the coater device is given reference numeral 1. Also part of the coater is body 2 which forms part of the coating chamber 3 and also forms one wall of the coating inlet 3A. The movable wall of the coating chamber as well as the outer wall of the coating chamber is formed by members 4 and 5. Member 5 can be designed to include a clamp tube (not shown but similar to 14 described below) to secure the orifice plate member 6.

25 An internal coating inlet seal 7 seals the ends of the coating inlet outside of the web run and under the edge dams 8 and 9. There is a metal support for the felt edge dam 9. This assembly seals the ends of the applicator between the orifice plate 7, roll 10 and doctor assembly 11. The edge dam assembly can be adjusted laterally on the dovetail or groove 7A on seal 7.

30 The doctor assembly 11A comprises the carrier, bed or support 11 for the doctor roll or bar 12. The bed or carrier 11 is made of UHMW polyethylene or similar material. The doctor roll or device 12 can be a solid bar (Fig. 3) or a hollow tube (Figs. 1 or 2), with or without grooves on its outer surface. If solid, the doctor device

is consequently generally of a smaller diameter than a hollow rod type doctor roll. Either type of doctor roll may be driven to rotate in a direction, usually, opposite the direction of the moving surface travel, be it a web or roll surface. The doctor's diameter can range from 3/8" to 1-1/2". If a hollow tube is used for the doctor device

5 12, it can be of sweated construction with cold water flowing through its center. A curved bar 13 supports the front of the support 11. The curved bar 13 is clamped to the main coater by an air pressurized clamp tube 14. The upper surface of the curved bar 13, as shown in Figure 1, forms a side of the application zone and seals against the edge dam assembly. Reliefs or cutouts 15 are provided in the support 11 for the doctor

10 bar 12. These reliefs allow the bar 12 to rotate more easily. Lateral grooves 16 with the pipe taps or other type connections are provided in either end of the support bed 11. Water is provided to these connections and circulated through these grooves or channels 16 to clean and lubricate the doctor bar or roll 12. A convex radius 17 is provided on the support or bed 11 swung from a pivot point 17A on its wall. A

15 support plate 18 supports the rear of the support bed 11 of the doctor assembly so that it is contained and not allowed to be moved by the friction against the travel of the web or surface being doctored. Alternatively, the support plate could be provided with a concave contact surface of the support.

When the doctor roll is driven (as indicated by the small arrow 18A) in a direction

20 opposite backing roll rotation (as indicated by the large arrow 18B), it has a tendency to lift the roll up at the rear when not in contact with the backing roll. In order to counteract this tendency, associated means both on the doctor roll support 11 and the rear support plate 18 can be provided. For example, the rear support plate or retainer 18 may have an upper hooked end 118 which engages in a retaining groove 118B in

25 the doctor support 11 (see Figs. 2 and 3). This arrangement acts as a baffle to prevent coating from egressing towards the loading tube 119. A doctor load tube 19 (somewhat similar to tube 14 in construction) is provided. It is pressurized with air or other fluid to increase the force of the doctor device against the traveling surface or web being doctored. A flexible profile bar 20 supports the load tube 19. This bar can

30 be profiled (adjusted in its cross machine direction) to give the desired doctor force by adjusting the differential screws thread profile screws 21. There is a plurality of the screws 21 spaced 3 to 4 inches apart laterally across the coater assembly. The doctor

support 11, on the enlarged shaped 13A end of the curved bar 13, allows the doctor assembly to pivot on the extended tip of the curved bar 13 when the loading by the load tube 19 is changed. The pivot point 17A shown at dovetail groove 23 retains the support 11 to the complementary shaped end or tip 13A of the curved bar 13. This connection allows movement and also seals the pivot. It should be understood there are other generally pivot type connection options, such as a rod and socket assembly, or other means that could be used.

Figure 2 is similar to Figure 1, except it shows the hooked plate or retainer 118 which can engage with the groove 118B on the support 11 to limit lift of the doctor. As the coaters shown in Figures 1 and 2 are generally similar except for this difference, similar reference numerals are used in Figure 2, except the number is 100 higher. For example, 4 of Figure 1 is shown as 104 in Figure 2.

Figure 3 is similar to Figures 1 and 2, but only shows the solid doctor rod 212 and its support 211. Note that the doctor rod 212 and its complementary groove receiving the rod are smaller in diameter than for a hollow doctor roll. Again, except for these differences, the rod and support of Figure 3 is similar to those of Figures 1 and 2, and reference numerals are also similar, except given numbers 200 higher, that is, 23 in Figure 1 or 123 in Figure 2, becomes 223 in Figure 3.

It should be understood that the doctor support of the present invention that can be used with any doctor be it generally integral in a coater, such as a short dwell time applicator type, or in a stand alone doctor roll, such as in a dip roll, separate doctor. It should also be understood that the doctor roll could have a plain smooth surface roll or a grooved roll. It should be further understood that the invention could be used when coating a paper or board web either directly or indirectly via a transfer roll. While specific elements and steps have been described, it should be understood that equivalent elements and steps will fall within the scope of the following claims.